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Commercial Trucks in the Field Army?

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ABSTRACT

The Army is considering a four-category system of trucks for the Field Army, namely, Military Hi-mobility Tactical, Military Tactical Standard, Quasi Military, and Commercial Administrative Types, which are broadly described and charted herein. Commercial trucks are generally not considered adequate for Field Army use; however, this proposed overall four-category system of trucks, potentially, can offer real military effectiveness at lowest cost. The success of the proposed system will largely depend on well supported and thorough truck engineering system design and cost studies to insure effective product implementation.

Commercial Trucks in the Field Army?

T. J. Bischoff

U. S. Army Mobility Command

THE ARMY is continuously conducting detail studies of its total qualitative, as well as quantitative, requirements for transport vehicles in the Field Army. These studies consider the possible substitution of commercial trucks for certain tactical trucks in the Field Army. Much progress has been made in these studies, which have as an objective the development of total wheeled vehicle program alternatives and their cost implications. This paper will discuss pertinent logistic factors and the role of commercial vehicles in the Field Army (trailers, buses, and staff cars excluded).

CURRENT POLICY

First of all, what is the present Army policy regarding use of commercial vehicles? Army Regulation 11-8 provides current policy which states:

" Para. 27b (2) - Commercial design vehicles will be used for administrative purposes to the maximum extent practicable. In overseas areas commercial design vehicles may be used to the extent consistent with local operating conditions, adequacy of maintenance facilities and availability of repair parts."

While the studies mentioned above continue in process, the current policy will also continue within the broadly stated parameters of AR 11-8. Upon completion and approval of current studies, it is possible that action will be taken to modify the present policy to reflect new guidelines and changes in the planned utilization of commercial trucks.

At present, the Army generally uses military trucks in all overseas commands and in all tactical and training units in the continental United States. Commercial trucks are generally used in the U. S. for administrative purposes only, where the military can use them to good advantage. In the U. S., the availability of good roads and adequate commercial maintenance - supply facilities (for repairs and spare

parts) - makes the use of commercial trucks feasible. In this case the Army need not stock spare parts in its own supply system.

PERHAPS A NEW POLICY

Logistic factors considered in the establishment of an outline of a total wheeled vehicle program have three important guidelines, namely:

1. Highest military effectiveness.
2. Optimum logistic support (supply and maintenance in the field).
3. Maximum economy (low cost).

Four general categories of vehicles are available and being considered for the Field Army. They are:

1. Military hi-mobility tactical trucks.
2. Military tactical standard trucks.
3. Quasi-military trucks.
4. Commercial administrative trucks.

From these it is possible to select a system (or mix) of vehicles with a wide range of military effectiveness and acquisition costs. The optimum system, or mix, would provide the maximum return for each defense dollar spent on their acquisition and use. In other words, this is how we would get "the biggest bang for a buck." To explain, more detail description of the proposed vehicle types and their uses follow:

1. Military hi-mobility tactical trucks. These are generally considered to be the current developmental XM-series of trucks when standardized. They would be best utilized in forward combat or Division areas, where maximum off-road mobility, swimmability, and effectiveness are required.

2. Military tactical standard trucks. These are the present standard M-series trucks used today and could be issued to combat support and other units requiring good off-road

NOTE: This paper presents discussion and judgments by the individual which should not be construed in any way as those of the U. S. Army.

mobility and effectiveness in rear Division and Corps areas.

3. Quasi-military trucks. These usually are considered as demilitarized versions of the M-series trucks. They could be issued to service support units for use in rear Corps and Field Army service areas, where only adequate or marginal mobility is acceptable. Both all-wheel drive (6×6, 4×4, and so forth, or rear-wheel drive (6×4, 4×2, and so forth) could be bought, depending on off-road mobility desired. These vehicles, definitely being versions of the M-series trucks, would require for the most part the same logistics support (repair parts, maintenance procedures, tools, and so forth). This is a distinct logistic advantage possessed over other types of semitactical trucks which might be considered for like applications.

4. Commercial administrative trucks. These are essentially straight, off-the-shelf, commercial vehicles without change (except for regular production options). These may be used (in addition to assignments in state-side administrative fixed base units) overseas in Field Army service and COMMZ areas by transportation motor pools, service support units, and administrative units where off-road mobility is not required.

The above general categories provide the "building blocks" for a motor transport system, or mix, of vehicle types which will possess a desirable range of effectiveness, mobility, and acquisition cost, provided it is well planned and implemented properly, provided the vehicles are assigned to Field Army units properly, and provided minimum impact on logistic support (supply of repair parts) is realized through maximum interchangeability (standardization) between the first three vehicle categories in each class.

To assist in further discussion of the above considerations, it would be appropriate at this time to review, in a general way, the inherent differences between vehicle types (military versus commercial) and also some background history. This will also aid in further discussion regarding use of commercial vehicles in the Field Army.

COMMERCIAL/MILITARY TRUCKS

Semantics (that is, signification of words) enters into any discussion of "commercial trucks" and "military trucks." To some, a commercial truck is strictly an off-the-shelf item that plys the U.S. highway every day; to others, it can be a modified version up-graded for military use (for example, the new M523E2 heavy equipment truck tractor) via production against a military performance specification. Some think of a military design, based upon a commercial model, as a commercial type (for example, the M-series 2-1/2 ton truck). At the same time, others think of the latter two examples as military trucks; while still others think of a military truck as being such only if it is designed exclusively for the military (for example, M151, 1/4 ton truck).

For purposes of this discussion, it is believed appropriate to define a commercial truck as an off-the-shelf item with

selected regular production options. Military trucks will be defined as all of the other examples given in the above paragraph, since they are generally built to meet military qualitative requirements and/or specifications.

Perhaps the differences between commercial and military truck characteristics can best be illustrated by Fig. 1, without going into elaborate details, military specifications, special performance requirements, and so forth. In broad terms, the military truck in the military environment is considered intrinsically different from, and definitely superior to, the apparently equivalent rated commercial truck in off-road mobility, reliability, user suitability, durability, transportability, and the like.

Commercial vehicles, on the other hand, are considerably less expensive to purchase and have lower individual maintenance (because of greater simplicity, for example, no front wheel drive, transfer case). They also have better fuel economy on roads.

Commercial trucks are of limited military use and, in fact, may be considered special-purpose vehicles to the Field Army, especially overseas. This type of vehicle would be detrimental to commanders overseas who may suddenly find themselves engaged in combat. The commercial trucks can seldom be used to replace battle-worn and damaged tactical trucks in combat units because they lack off-road mobility and military effectiveness (Fig. 1). Further, they would greatly burden the parts supply system and create a huge supply and maintenance problem, because of the inherent numbers and large variety of makes and models which would inevitably appear after a few years of procurement. As a result, more different parts would be needed to support even a small commercial truck fleet overseas than are needed to support the entire U. S. tactical vehicle fleet. The quasi-military standard vehicle would be more appropriate in this situation and would be more readily supportable. They would also provide an emergency back-up for the field commander in case of major conflicts.

BACKGROUND HISTORY

A review of the past will aid in understanding the problem.

In World War I, the Army went in with and used commercially available vehicles. The result was that a great number of truck makes, models, and types were introduced. The AEF had only about 30,000 trucks abroad of various makes: for example, White, Garford, Pierce Arrow, Federal, Packard, IHC, Mack, Wilson, Moreland, Peerless, Paige, Republic, and so forth. This menagerie resulted in 445,000 line items of spare parts required. Though the quantity (vehicles) was small, the headaches (parts support) were large.

Actually, the AEF only received 87,000 line items of spares (about 20% of requirements). The heterogeneous nature of the fleet made the maintenance problem almost impossible. Some 50-60% of the vehicles were unserviceable at any given time. Repair work practically came to a halt as the maintenance personnel had all they could do to han-

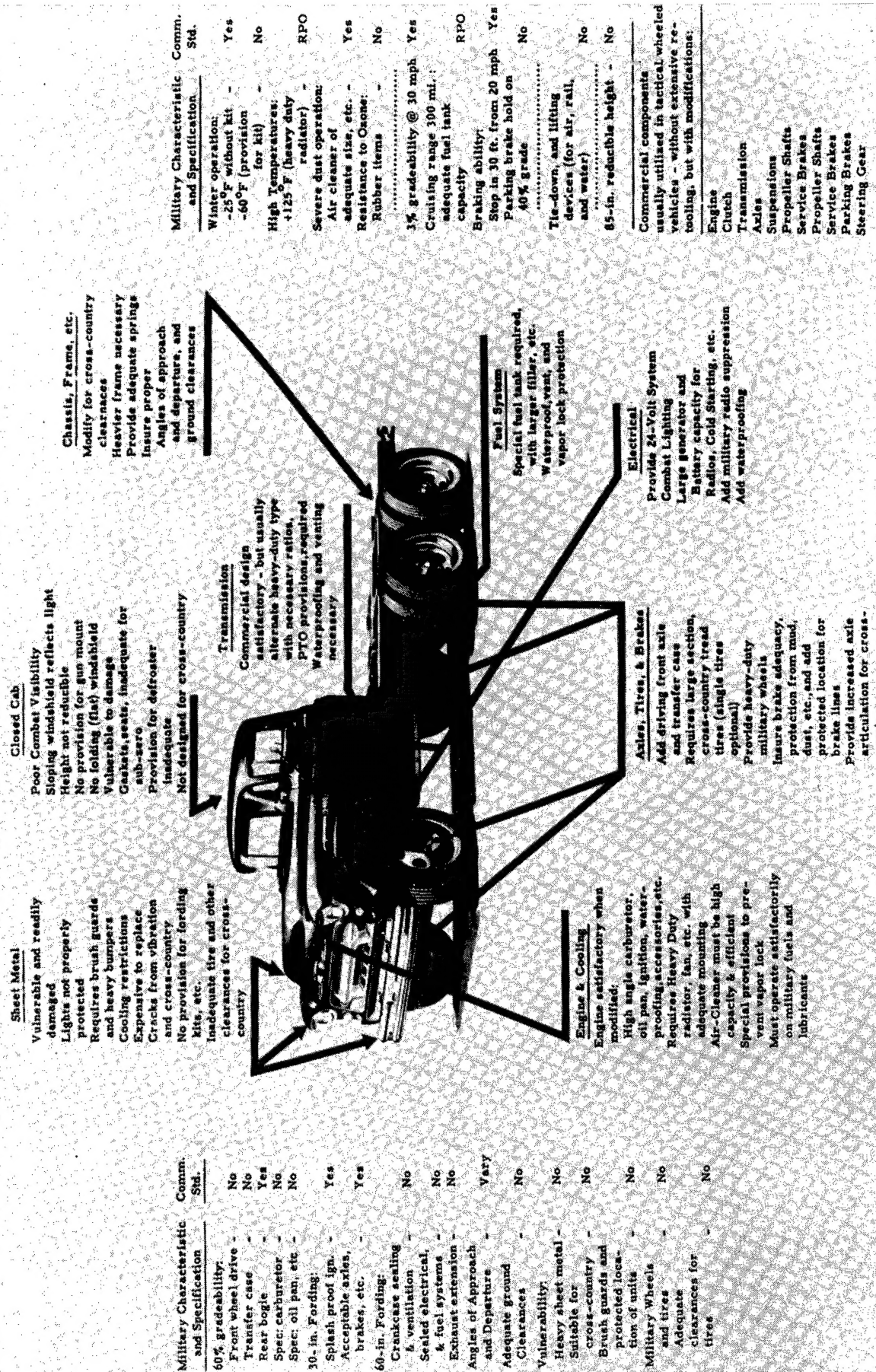


Fig. 1 - Comparison: Commercial and Military Characteristics, Detroit Arsenal Neg #50439, 7 Sep 56.





































WORLD WAR II FLEET				1954 FLEET							
MAJOR COMPONENTS		BASIC VEHICLES		BODY TYPES		BASIC VEHICLES		MAJOR COMPONENTS			
		● (PRIMARYLY FOR INTERNATIONAL - AID)		VARIATIONS OF BASIC VEHICLES (CONDENSED LISTING)							
ENGINES:	18	1/4 TON, 4 X 4 (WILLYS & FORD)		UTILITY TRUCKS	CARGO - PERSONNEL (1/4 TON)		1/4 TON, 4 X 4 (WILLYS)	ENGINES:	7		
		3/4 TON, 4 X 4 (DODGE)			COMMAND (3/4 TON)					3/4 TON, 4 X 4 (DODGE)	
		1 1/2 TON, 4 X 4 (CHEVROLET)			PANEL (3/4 TO 1 1/2 TON)						
		(FORD)			CARRYALL (3/4 TON)						
		1 1/2 TON, 6 X 6 (DODGE)									
TRANSMISSIONS	19	2 1/2 TON, 6 X 4 (STUDEBAKER)		AMBULANCE	FRONT LINE (1/4 TO 3/4 TON)			2 1/2 TON, 6 X 6 (REO & STUDEBAKER)	TRANSMISSIONS:	7	
		(GMC)			FIELD (3/4 TON)			(GMC)			
		2 1/2 TON, 6 X 6 (GMC)			CARGO TRUCKS			WEAPONS CARRIER (3/4 TON)			
		(STUDEBAKER & REO)						CARGO - PERSONNEL (3/4 TO 2 1/2 TON)			
		(IHC - FOR NAVY)						CARGO - PRIME MOVER (1 1/2 TO 10 TON)			
4 TON, 4 X 4 (FWD)		LONG (STD)(1 1/2 TO 10 TON)									
4 TON, 6 X 6 (DIAMOND "T")		EXTRA LONG (1 1/2 TO 10 TON)									
FRONT AXLES:	21	4-5 TON, 4 X 4 (AUTOCAR & WHITE)		VAN TRUCKS	CARGO VAN (2 1/2 TO 10 TON)		5 TON, 6 X 6 (IHC, DIAMOND "T" & MACK)	FRONT AXLES:	7		
		(FEDERAL)			SHOP VAN (2 1/2 TO 10 TON)						
		5 TON, 4 X 2 SEMI-TACTICAL (IHC, KENWORTH, MARMON, HERRINGTON)			MEDICAL VAN (2 1/2 TO 5 TON)						
		5-6 TON, 4 X 4 (FWD)			EXPANSIBLE VAN (2 1/2 TO 5 TON)						
		(AUTOCAR)			DUMP TRUCKS (1/2 TO 15 TON)						
6 TON, 6 X 6 (WHITE, CORBITT, BROCKWAY)		TRUCK TRACTOR (1 1/2 TO 15 TON)									
(WARD LA FRANCE, FWD)			WRECKER TRUCKS (2 1/2 TO 10 TON)								
(MACK)				CRANE TRUCKS (3/4 TO 10 TON)							
7 1/2 TON, 6 X 6 (MACK)						TANK TRUCKS					
(FEDERAL, REO, BEIDERMAN - FOR AIRFORCE)					FUEL (1 1/2 TO 10 TON)						
10 TON, 6 X 4 (WHITE)		WATER (2 1/2 TON)									
(MACK)		MAINTENANCE TRUCKS									
10 TON, 6 X 6 (WARD LA FRANCE & KENWORTH)			TELEPHONE (3/4 TO 2 1/2 TON)								
CRANE, M2 (THEW-LARRAINE)			LIGHT MAINT. (3/4 TON)								
12 TON, 6 X 4 (FEDERAL)			AMPHIBIOUS TRUCKS (1/4 TO 10 TON)								
(DIAMOND "T")				CHASSIS TYPES (AS REQUIRED)							
15 TON, 6 X 6 (PCF)		SWB, LWB & XLWB									
		SINGLE AND DUAL TIRES									
		SPECIAL PURPOSE TRUCKS									
TIRES:(SIZES)	13				ALL TYPES: AS REQUIRED BY USING SERVICES.				TIRES:(SIZES)	6 (or 7)	
							10 TON, 6 X 6 (MACK)				
							15 TON 8 X 8 (KENWORTH)				

Fig. 2 - Tactical Vehicle Fleet Comparison Detroit Arsenal Neg #52004.

dle the numerous parts. In fact, combat troops were being transferred to the supply services to handle the parts problem when the war ended and the problem was solved.

As might be expected, World War II showed a marked improvement. The number of trucks delivered to the Army was far greater and efforts were made at standardization. Tactical trucks based upon commercial designs were generally used. Although a step was taken in the right direction, it was certainly a far cry from optimum standardization. About 27 different basic chassis were involved.

It would be fair to say that the Army used one-fourth the number of makes and models as in World War I. Was the Army happy with this improvement? The answer: No! While we had a pseudo-standardization of vehicles manufactured by different producers, we entered the war with a supply system based upon vehicle manufacturers' catalogs and parts numbers. The result was about 450,000 line items of spare parts. Actually, research cataloging cross-referencing after the war revealed that these 450,000 line items were represented actually by only 125,000 parts. This, of course, indicates the necessity and desirability of a good parts numbering and cataloging system.

Was Congress happy with the Army's motor fleet in World

War II? The answer, here too, is No! In a review afterwards the Senate expressed concern that the military had not standardized more fully and avoided having so many varieties of trucks and spare parts. Although the overseas fleet of trucks was less than one-fourth as diverse as the World War I fleet, it was still too heterogeneous for efficient military administration and effectiveness.

Post World War II - Since World War II the Army has gradually purified the system of the World War II trucks (Fig. 2). They have now been replaced by the M-series trucks. This new M-series (1/4, 3/4, 2-1/2, 5, and 10 ton classes) consists of only six basic types of chassis, a vast reduction (about 75%) from that of World War II. This greatly reduced the spare parts problem, which, together with the successful prosecution of the stock numbering program, constitutes a tremendous stride forward in the relief of congestion in spare parts supply with concurrent possibilities of reduction of maintenance deadlines.

How many spare part line items do we have today? The 450,000 line items for trucks and trailers of all types in World War II have been reduced to 67,000, a reduction of 85%. Only about one-half of these are for the military trucks. This has been achieved by standardization of military ve-

hicles. Of course, if commercial vehicles had been introduced into the fleet, this would have raised the quantity of line items substantially.

Congress, too, in 1952 recognized the problems of supply (as well as the tremendous inventories of all types of material throughout the Government) by decree of Public Law 436 that more standardization be achieved in order to reduce the numbers of sizes, kinds, or types of generally similar items. Public Law 413 also authorized selective procurement to maintain desirable standardization.

All of this emphasizes the reasons for the Army's concern with any action that leads to decreased standardization.

Of course, there may be special situations where it would be advantageous to use commercial vehicles overseas in field units; however, these cases should not be allowed to completely disrupt the entire system of maintenance and supply of the transport fleet. Special cases for the use of commercial trucks should be recognized for what they are: particular and unique opportunities for exploitation on special projects for limited periods.

COMMERCIAL COMPANY SOLUTION

Are the military the only people who seek standardization? No! Commercial truck operations go heavily along the standards route. Many a commercial fleet uses only a few models of trucks for lowest cost and maintenance. Pic-Walsh Freight Co., for example, with a fleet of about 250 trucks plus about 500 trailers, has this to say (4)* about standardization:

"Standardization of our vehicles, major components, and maintenance procedures has been a key factor in the growth and success of the Pic-Walsh Freight Co. The major benefits of this standardization are that it permits a reduction of parts inventories and promotes simplification of maintenance procedures."

Study (2) cited the Arabian American Oil Co., in Saudi Arabia, because of its situation abroad, as a closer parallel, since many of its problems are similar to those faced by the Armed Forces. Like the Armed Forces overseas, ARAMCO is distant from the sources of supply for its vehicles. This distance exaggerates the problem of selection, requisition, and transportation to the zone of its operations. Like the Armed Forces, it had the problems of receiving, stocking, recording, and maintenance--all of which were vital to its day-by-day operations.

What was their solution? In a nutshell--standardization! It is understood that ARAMCO used the absolute minimum of makes and models of trucks. Why? For training and maintenance (spare parts included) dollar savings. In 1946 the company had 11 makes of trucks. In 1952 it had standardized on only three makes. When a change is mandatory ARAMCO abandons the old vehicle completely; not a single truck of the old model is kept in operation. They are all

*Numbers in parentheses designate References at end of paper.

Table 1 - Estimated Total Trucks for the Military

	Total, %	Commercial, %	Military, %
Army	100	20	80
Other Services	100	75	25
Total (All Services)	100*	40	60
Average Yearly Military Procurements	50,000/yr**		
Average Yearly MAP Procurements	10,000/yr***		
Combined Average	60,000/yr		

*Estimated at 500,000 in peacetime (3,000,000 in wartime).

**Estimated on basis of 10-year life expectancy.

***Estimated.

removed, especially the old spare parts, in order to keep the maintenance system simple enough to be feasible and economical.

This, then, is the policy of a commercial company operating abroad. Surely, it is an efficient, effective system, or it would not be tolerated in a competitive commercial society.

If such a system is economical for a single company located in one geographic area of the world, is it not reasonable to believe that it would be economical for the Army which operates world-wide?

CURRENT STATUS

The military services today have a large number of trucks as indicated in Table 1, with the Army as the big user of military trucks. With its low quantity of supporting spare part line items, it has a manageable and efficient supply and maintenance (S&M) system. If commercial vehicles were introduced (along with spare parts) into the Army's supply and maintenance system, it could indeed lose much of its effectiveness.

How can a truly effective fleet of trucks for the military be best achieved at lowest practicable cost? This is a problem which the military, primarily Army Materiel Command (AMC) and Combat Development Command (CDC), must consider on the overall wheeled vehicle program (as indicated earlier in this paper). Studies must develop and offer total wheeled vehicle program proposals with their cost implications. General objectives should include:

1. Maximum military effectiveness (namely, maximum mobility, utility, performance) to meet the needs of the user.
2. Optimum logistic support, namely, maximum stand-

Table 2 - Four-Category Truck System

Implementation Guides	Vehicle Categories	Vehicle Performances	Program Advantages
Design for Low Cost	1. Military hi-mobility tactical 2. Military tactical standard 3. Quasi-military 4. Commercial administrative	Maximum mobility Float-swimability Maximum military effectiveness Good mobility Deep water fordability Good military effectiveness Adequate or marginal mobility Shallow water fordability Marginal military effectiveness Housekeeping and special functions	Equipment system with world impact
Secure Reasonable Competitive Procurement Package for Overall Vehicle			Performance tailored to job
Obtain Reasonable Proprietary Data and Drawings on Components if Consistent w/Lowest Cost			Unified and effective logistic support
Utilize Industrial Component Base (Including Tooling, Facilities, etc.)			Minimum line item parts support
Set Durability-Reliability Goals Apropos to Average Difficult Conditions in the Military Environments			Optimum cost/effectiveness
Eliminate (in Development) Features of Marginal Value			Sheer useful functionalism
Consider Marketing of Used Vehicles (Say After 5 yr) Through Appropriate Outlets			

ardization, parts interchangeability, minimum spare part line items.

3. Maximum economy, including lowest acquisition costs, support costs.

As indicated earlier, study efforts have considered four categories of vehicles in each payload class:

1. Military hi-mobility tactical trucks.
2. Military tactical standard trucks.
3. Quasi-military trucks.
4. Commercial administrative trucks.

This proposed system of four categories of vehicles for each payload class can be very effective if properly implemented. With four categories of vehicles within each class, each with its relative price and performance ranges, vehicle types may be tailored to the needs of the individual field unit; the combat units would get the most mobile and effective equipment where it is most needed and justifiable. On the other hand, other types of units could select other lower cost equipment most suitable to its needs.

These four categories were described earlier in terms of proposed applications; for example, the current XM-series might be the high mobility type; current M-series could continue to be the standard tactical type; demilitarized version of the M-series would be a quasi-military type; and regular off-the-shelf commercial vehicles would be the administrative type.

Tables 2 and 3 outline a similar four-category truck system in more general terms without specifying the particular vehicles to implement the program. Table 2 indicates the advantages of the four-category truck system.

advantages without pre-empting current XM-series or M-series vehicles. Table 3 suggests probable features in a general way for each category of vehicle, with acquisition costs higher or lower commensurate with performance and effectiveness differentials.

To insure effective implementation of the four-category truck system, it is considered appropriate that system design studies be conducted in depth in each payload class with a view toward developing truly integrated lowest cost and maximum effectiveness systems of vehicles. Such action would be directed toward the advantages indicated in Table 2. An integrated system of trucks would encompass only category I (military hi-mobility), category II (military tactical), and category III (quasi-military). The commercial administrative type should retain the status quo (namely, off-the-shelf) and in general only be issued where parts and service are readily available.

The category III vehicles of the four-category truck system offers special advantages not always realized in the past. Because of its common relationship to categories I and II, and common supply and maintenance base, it could be an ideal MAP vehicle where lower performance and effectiveness are adequate. Further, being of sufficiently basic rugged design, it is able to meet wartime road conditions and provide a backstop for the categories I and II vehicles. Supply of parts would be, in general, applicable across the board, since all three categories would be substantially alike. It would also support the production base of categories I and II vehicles and result in lower overall costs through higher production volume.

Table 3 - Suggested Features of the Four-Category Truck System

	1	2	3	4
	Military Hi-mobility Tactical	Military Standard Tactical	Quasi- Military Tactical	Commercial Administra- tive
<u>Mobility Features</u>				
All Wheel Drive	Yes	Yes	Optional	No
Tires & Wheels	Mil	Mil	Comm	Comm
	Oversize NDCC	Normal NDCC	NDCC	Highway
Locking Differentials	Yes	Optional	No	No
Suspension	Mil	Mil	Comm	Comm
Ground Clearance, Angles of Approach & Departure, Ramp Angle, etc.	Maximum	Good	Fair	Poor
Gradeability 60%	Yes	Yes	Optional	No
Front Winch	Yes	Optional	No	No
<u>Water Crossing Features</u>				
Float-swimability	Yes	No	No	No
Deep Water Fording	Yes	Yes	No	No
Shallow Water Fording	Yes	Yes	Yes	Yes
Waterproofing of Com- ponents	Mil	Mil	No	No
Corrosion Resistance	Mil	Mil	Comm	Comm
<u>Military Effectiveness Features</u>				
Engine	Mil	Mil	Comm	Comm
Transmission	Mil	Mil	Comm	Comm
Transfer	Mil	Mil	Optional	None
Axles (rear)	Mil	Mil	Comm	Comm
Cab	Mil	Mil	Comm	Comm
Frames & Body	Mil	Mil	Comm	Comm
Electrical	Mil	Mil	Comm	Comm
Lighting System	Mil	Mil	Comm	Comm
B.O. Drive System	Mil	Mil	No	No
Instruments	Mil	Mil	Comm	Comm
Waterproofing (elect.)	Mil	Mil	No	No
Radio Suppression	Mil	Mil	Comm	Comm
Fungus Proofing	Mil	Mil	No	No
Seats	Mil	Mil	Comm	Comm
Desert Cooling	Yes	Yes	Optional	No
Arctic Operation	Yes	Yes	No	No
Kit Provisions	Yes	Yes	No	No
Paint Specifications	Mil	Mil	Comm	Comm
Accessories	Mil	Mil	Comm	Comm
Protective Guards	Yes	Yes	Optional	No
Brakes	Mil	Mil	Comm	Comm
Rubber Products	Mil	Mil	Comm	Comm
Fuel System	Mil	Mil	Comm	Comm
Seals	Mil	Mil	Comm	Comm

(cont'd)

Table 3 - cont'd.

	1	2	3	4
	Military Hi-mobility Tactical	Military Standard Tactical	Quasi- Military Tactical	Commercial Administra- tive
<u>Military Effectiveness</u> <u>Features - Cont'd</u>				
Cruising Range	Maximum	Maximum	Marginal	Marginal
P. T. O.	Yes	Yes	Optional	No
Reducible Height	Yes	Yes	Optional	No
Lifting & Tie Down Devices	Mil	Mil	Comm	Comm

NOTE:

Mil - Means militarized, military design, military specifications, military type, suitable for military use, military method, etc., as the case may be.

Comm - Means commercial type, method, design specification, etc., as the case may be.

SUMMARY

An integrated system of categories of trucks tailored to the job requirements can have real advantage: the user would get the product needed where needed; manageable logistic support would be insured; and, lowest system over-all cost would be realized.

With this system a basic vehicle design would be the category II military tactical vehicle. It would be the foundation for categories I and III vehicles with the addition or removal of features as suggested in Table 3. Commercial trucks should retain the status quo, that is, be used where suitable to the job requirements and where they can be readily supported without disrupting the Army's supply and maintenance system.

Current Army staff studies appear to be well directed to-

ward ultimate attainment of an effective but low cost system of military trucks. The ultimate success will depend largely on well-funded, careful vehicle engineering system studies to insure effective implementation.

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